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Additional information on *Lecanora loekoesii*

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Abstract — Sixty-eight specimens of *Lecanora loekoesii* from China were collected for further study to supplement data derived from the South Korean type (previously the only known specimen). The ascospores of *L. loekoesii* often appear to be 1-septate because the protoplasm is divided. Four chemical types of *L. loekoesii* were discovered.

Key words — Asia, taxonomy, lichen, fungi

Introduction

The multispored species of *Lecanora* include eleven members worldwide: *L. bruneri* Imshaug & Brodo, *L. cateilea* (Ach.) A. Massal., *L. japonica* Müll. Arg., *L. loekoesii*, *L. pleospora* Müll. Arg., *L. polysphaeridia* Alstrup, *L. praesistens* Nyl., *L. sambuci* (Pers.) Nyl., *L. strobilinoides* Giralt & Gómez-Bolea, *L. subjaponica* L. Lü & H.Y. Wang, and *L. weii* L.F. Han & S.Y. Guo (Alstrup 1993, Guderley & Lumbsch 1999, Han et al. 2009, Lü et al. 2011, 2012). *Lecanora strobilinoides* is the only species where the ascospores are frequently 1-septate.

As a new species to science, *L. loekoesii* was described by only one specimen from South Korea (Lü et al. 2011). In the present paper, a more detailed and complete description of this species is given based on 68 specimens from China.

Materials & methods

The specimens studied are preserved in SDNU (Lichen Section of Botanical Herbarium, Shandong Normal University). The morphological and anatomical characters of the specimen were examined using a stereomicroscope (COIC XTL7045B2) and polarizing microscope (Olympus CX41-32). Lichen substances were identified using standardized thin layer chromatography techniques (TLC) with C system (Orange et al. 2010). Photos of the lichen were taken under Olympus SZX16 and BX61 with DP72.

Results & discussion

Lecanora loekoesii Y. Joshi, L. Lü, & J.S. Hur, *Lichenologist* 43(4): 321–329 (2011)
Figs 1–2

Description — The *L. loekoesii* specimens from China are characterized by the following characters: corticolous habit; thin continuous crustose thallus that is whitish gray to grayish green; soredia, prothallus, and pycnidium all lacking; indistinct cortex with crystals; lecanorine apothecium; yellowish brown apothecial discs with/without white pruina; amphithecium with indistinct cortex and small K-soluble crystals; epihymenium with coarse K-soluble granules; hyaline hymenium without oil droplets; hyaline hypothecium; simple non-pigmented paraphyses; 12–16-spored asci; simple or 1-septate-like (due to divided protoplasm) ellipsoid hyaline ascospores; and thallus spot tests of K+ yellow, KC+ yellow, C-, and P+ yellow.

Both the Chinese specimens and Korean holotype of *L. loekoesii* have the same epihymenium crystals. Lü et al. (2011) described the crystals in epihymenium of holotype as fine granules. However, we think these are better interpreted as coarse granules. Half of the *L. loekoesii* specimens from China have 1-septate-like ascospores because the protoplasm is divided, while the ascospores of the holotype are simple. We observed the 1-septate-like ascospores often in the same apothecium or even in the same ascus together with the simple ascospores.

We retested the lichen substances of the holotype by TLC; in addition to atranorin, usnic acid, zeorin and norstictic acid, we found three unknown lichen substances B, D, and E were found (Fig. 2). Of the 68 Chinese specimens tested, 51 have the same chemicals as the holotype, 14 specimens lack norstictic acid, two specimens have placodiolic acid, while one specimen has stictic acid plus an additional unknown substance J.

Distribution in China — Heilongjiang, Jilin, Liaoning, Hubei, Shaanxi, Tibet.

Specimens examined (except for the holotype, all conserved in SDNU): **Chemical type 1: SOUTH KOREA**. **Gangwon-do**, Taebaek-si, Mungoksodo-dong, Mt. Taebaek, 37°06′48·8″N 128°56′51·0″E, alt. 910 m, on *Quercus* bark, 13 Oct 2005, Lőkös 050717 (holotype, KoLRI). **CHINA**. **Heilongjiang**, Wuchang, Mt. Datudingzi, alt. 1800 m, 21 Aug 2011, Y.L. Cheng 20122274B; alt. 1300 m, 21 Aug 2011, Y.L. Cheng 20122316B; alt. 1200 m, 21 Aug 2011, Y.L. Cheng 20122060A1, 20122233B, 20122249, 20122249D1, 20122273B, 20122288C; alt. 1100 m, 21 Aug 2011, Y.L. Cheng 20122088B, 20121912, 20122047, 20122149B, 20122220D, 20122394A; alt. 900 m, 21 Aug 2011, Y.L. Cheng 20127190; alt. 800 m, 21 Aug 2011, Y.L. Cheng 20122097, 20122155B, 20122155B1, 20122212B, 20122311A; Daxinganling, Mt. Daqing, alt. 800 m, 26 Aug 2011, Y.L. Cheng 20125519A; Heihe, 727 linchang, alt. 488 m, 16 Aug 2009, Q. Ren 20100966; Tahe, Mt. Baikalu, alt. 700 m, 24 Aug 2011, Y.L. Cheng 20125087; Tieli, Taoshan national forest park, alt. 900 m, 23 Aug 2011, Y.L. Cheng 20125116B, 20125738A, 20125154; alt. 800 m, 23 Aug 2011, Y.L. Cheng 20125355A1, 20125607B, 20125687E, 20125694B, 20125759B; alt. 700 m, 23 Aug 2011, Y.L. Cheng 20125310, 20125348A, 20125628A, 20125648,

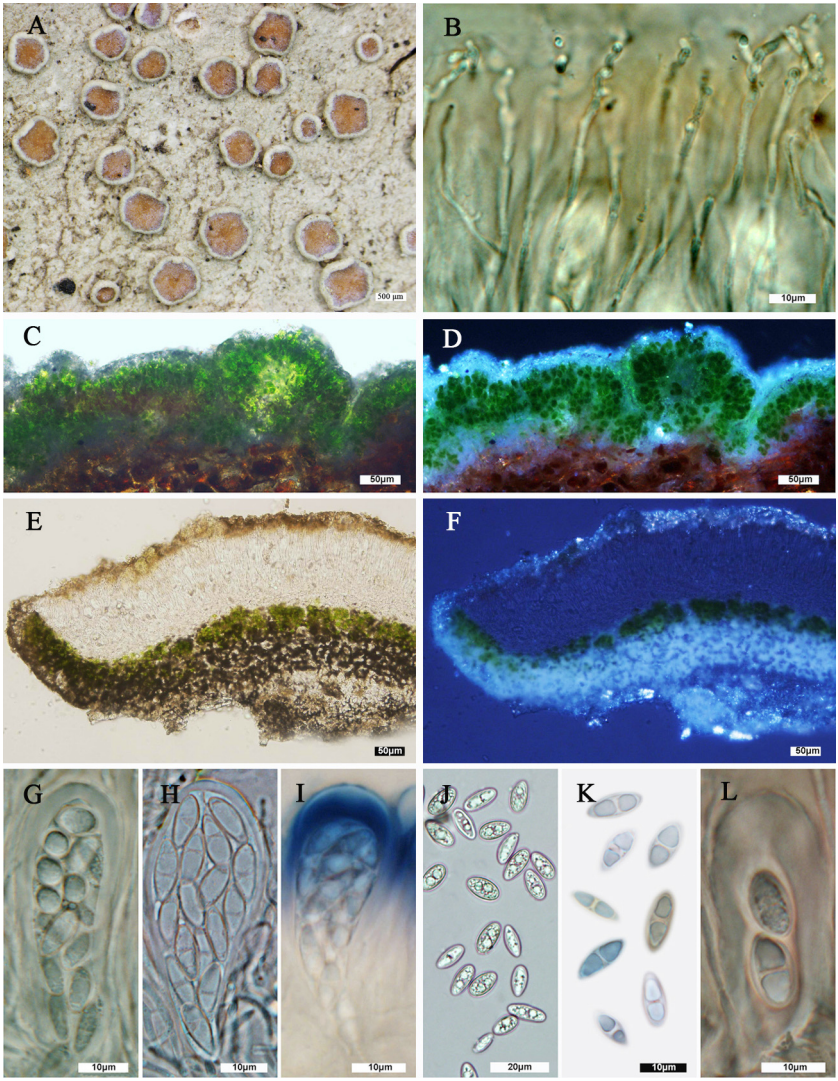

Fig. 1. *Lecanora loekoesii* (20122249, SDNU). A: Thallus; B: Paraphysis; C, E: Anatomy of thallus and apothecia; D, F: Crystals of thallus and apothecia; G–H, J–L: Asci and ascospores; I. Iodine reaction of ascus.

20125751, 20125775. **Jilin**, Helong, Mt. Zengfeng, alt. 1600 m, 19 Aug 2011, Y.L. Cheng 20119440C, 20119440D, 20119643A; alt. 1500 m, 19 Aug 2011, Y.L. Cheng 20120261A, 20119686C, 20119841; alt. 1000 m, 19 Aug 2011, Y.L. Cheng 20119329A; Wangqing, Dadoudigou, alt. 900 m, 23 Jul 2012, H.Y. Wang 20128203, 20128211. **Liaoning**, Kuandian, Mt. Huabo, alt. 1000 m, 16 Aug 2011, Y.D. Wei 20120438C; alt. 900 m, 14

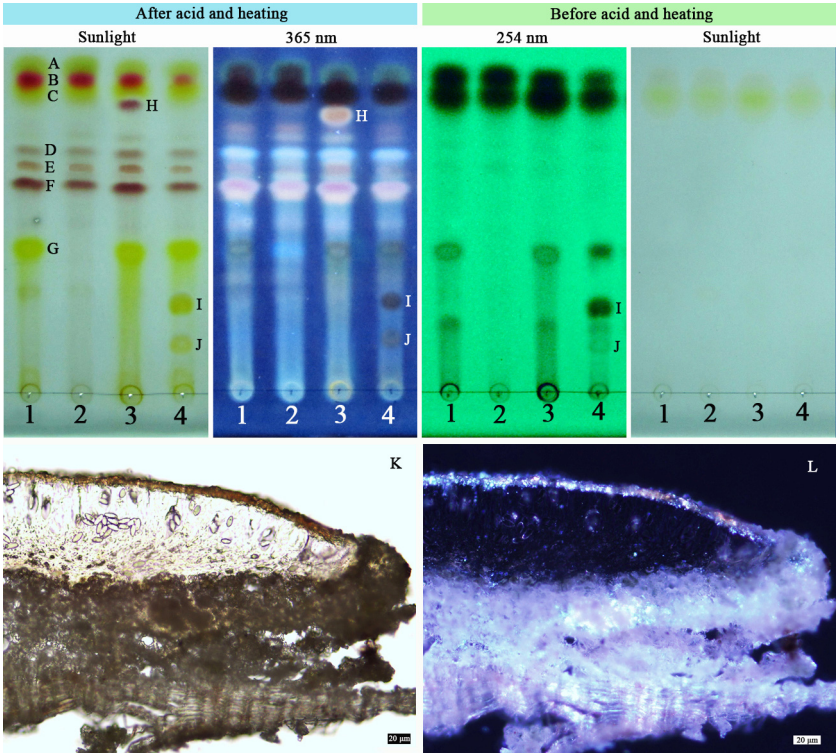

Fig. 2. *Lecanora loekoesii*: TLC results and crystals in holotype apothecium. A: Atranorin; C: Usnic acid; F: Zeorin; G: Norstictic acid; H: Placodiolic acid; I: Stictic acid; B, D, E, J: Unknown substances; K, L: Section and crystals of apothecium of holotype. Chemical type 1: 52 specimens detected, including holotype; Chemical type 2: 14 specimens detected; Chemical type 3: Two specimens detected; Chemical type 4: one specimen detected.

Aug 2011, Y.D. Wei 20120449A, 20120450A: 16 Aug 2011, Y.D. Wei 20120547; alt. 800 m, 16 Aug 2011, Y.L. Cheng 20120514A.

Chemical type 2: **CHINA**. **Heilongjiang**, Wuchang, Mt. Datudingzi, alt. 1200 m, 21 Aug 2011, Y.L. Cheng 20122139, 20122261A7, 20122288D; alt. 1100 m, 21 Aug 2011, Y.L. Cheng 20122126B; alt. 900 m, 21 Aug 2011, Y.L. Cheng 20122243B; alt. 800 m, 21 Aug 2011, Y.L. Cheng 20122068A, 20122212A, 20122231B. **Jilin**, Helong, Mt. Zengfeng, alt. 1600 m, 19 Aug 2011, Y.L. Cheng 20119440A; alt. 1500 m, 19 Aug 2011, Y.L. Cheng 20119686B. **Hubei**, Shennongjia, Mt. Jinhou, alt. 2190 m, 9 Nov 2008, Z.T. Zhao 20101591. **Shaanxi**, Meixian, Mt. Taibai, alt. 2900 m, 17 Jun 2011, Y.L. Cheng 20114386D. **Tibet**, Nyingchi, Lulangzhen, alt. 2500 m, 17 Jul 2011, Y.L. Cheng 20119194, 20119213A.

Chemical type 3: **CHINA**. **Heilongjiang**, Tieli, Taoshan national forest park, alt. 800 m, 23 Aug 2011, Y. L. Cheng 20125175; alt. 700 m, 23 Aug 2011, Y. L. Cheng 20125762.

Chemical type 4: **CHINA**. **Heilongjiang**, Wuchang, Mt. Datudingzi, alt. 1100 m, 21 Aug 2011, Y.L. Cheng 20122106B.

Comments — *Lecanora loekoesii* is similar to *L. strobilinoides* in morphology and anatomy. The latter is the only multispored *Lecanora* species that frequently has 1-septate ascospores. However, *L. strobilinoides* can be readily distinguished by having only usnic acid and zeorin. In addition, *L. loekoesii* ascospores are not truly 1-septate.

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